Performance Test/RATAs Update

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What is a Performance Test?

- Commonly referred to as a stack test, trial burn or performance test

- A performance test is used to:
  - Measure the amount of regulated pollutants that are emitted from a point source;
  - Verify capture efficiency from a capture system;
  - Verify destruction/removal efficiency of a control device.

Why performance test?

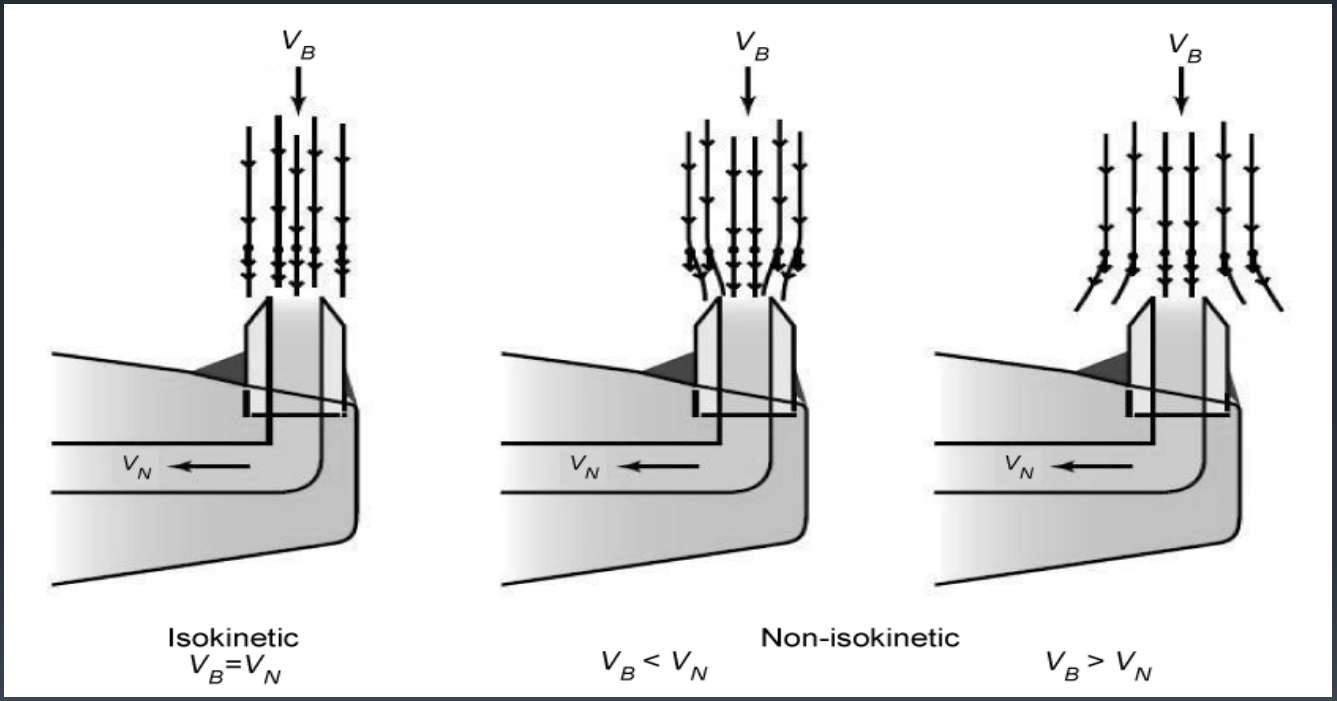
- New unit (engine, boiler, turbine, etc.)
- New control equipment (baghouse, scrubber, etc.)
- Quarterly, semi annual, annual emission checks

Types of Performance Testing

- Most common types of testing are:
  - Isokinetic Sampling
  - Instrumental Sampling (Analyzers)
  - To determine percent isokinetic:

$$\%I = \%\,\text{isokinetic} = 100\left(\frac{V_{nozzle}}{V_{stack}}\right) = \frac{0.0944\,T_s\,(V_m)_{std}}{P_s\,v_s\left(\frac{\pi\,D_n^2}{4}\right)\Theta\,(1-B_{ws})}$$

Isokinetic Sampling

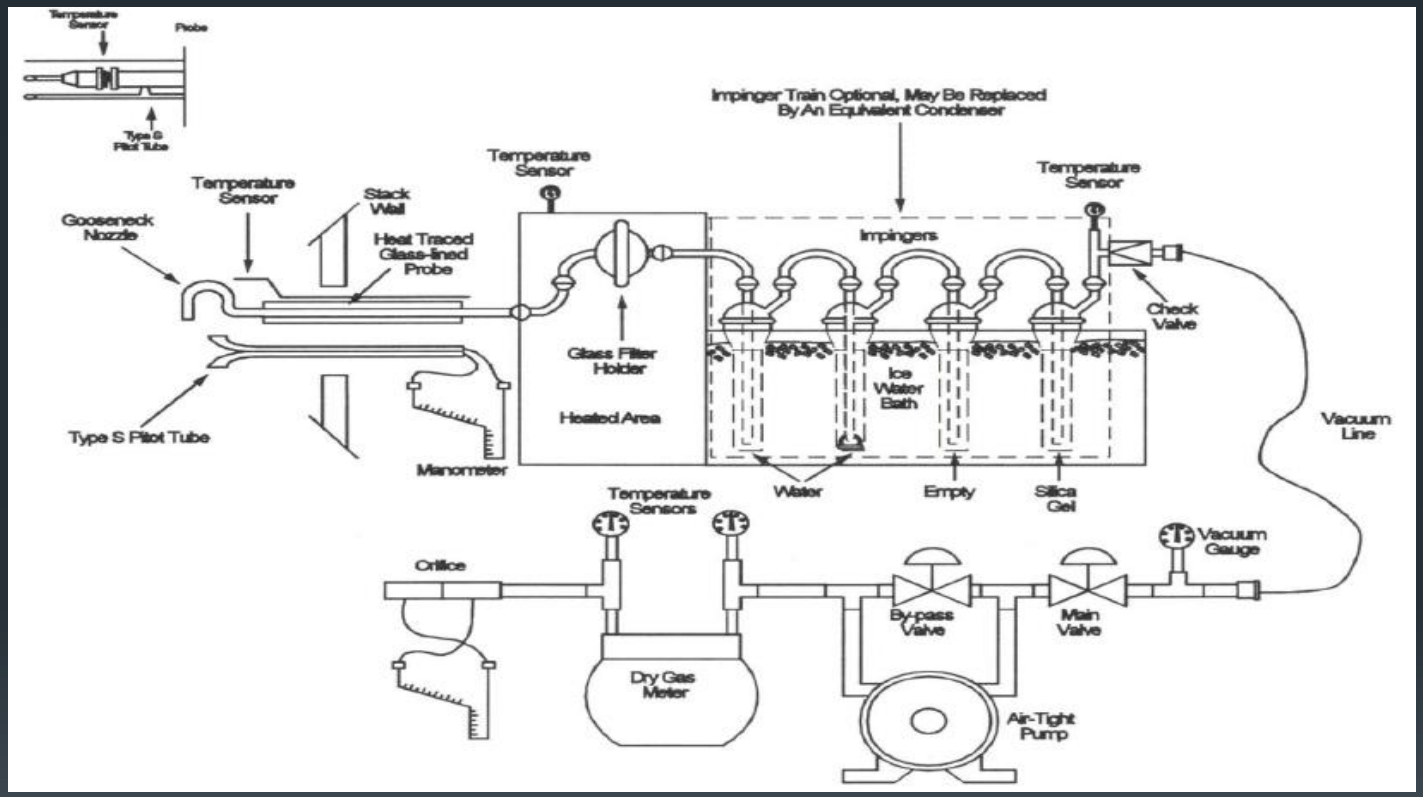


Types of Performance Testing

- Most common types of testing are:
  - Isokinetic Sampling
    - Particulate matter (PM) – RM5/202, RM17, RM201A
    - Dioxins/Furans (D/Fs) – RM23
    - Chrome & other metals – RM29, RM306
    - Lead – RM12

US EPA Reference Method 5

US EPA Reference Method 5



Captures PM

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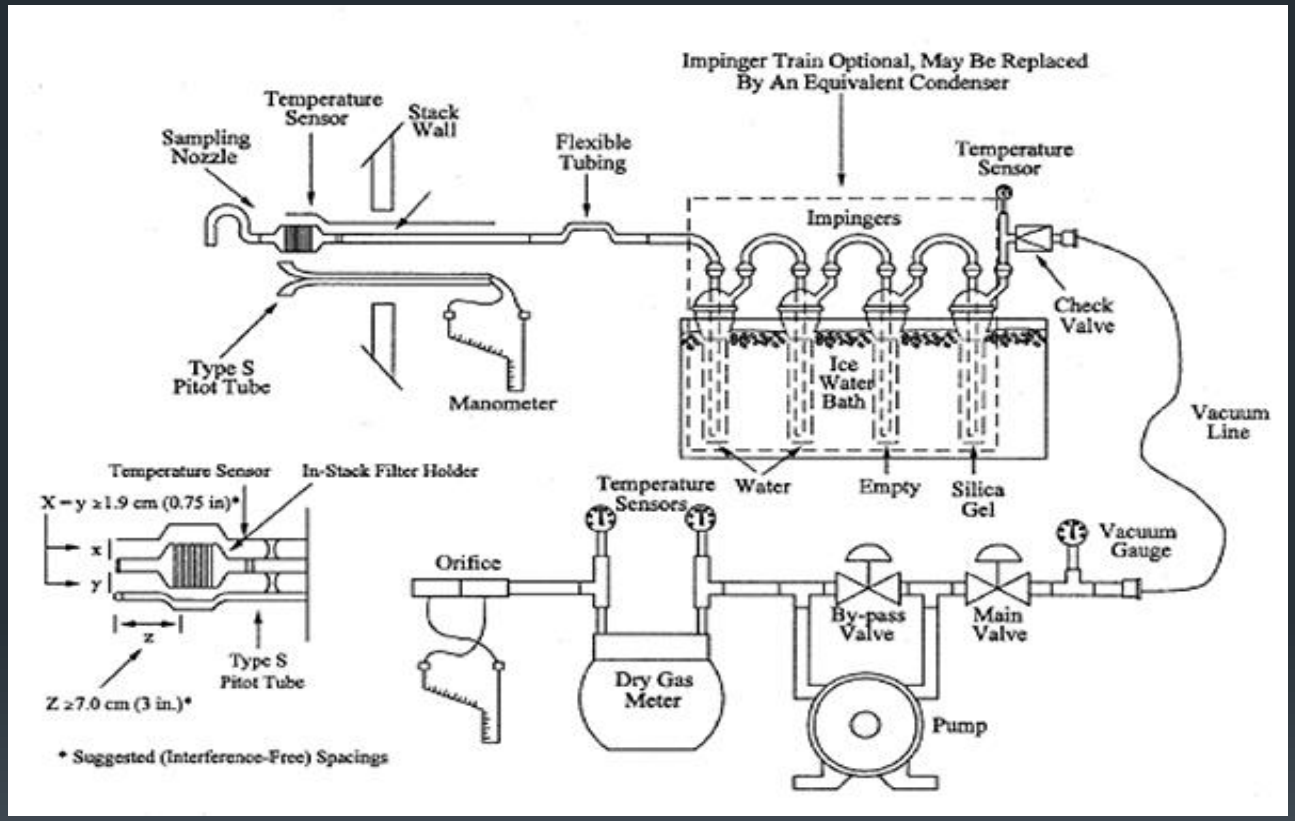
US EPA Reference Method 17



Captures PM (in stack filter)

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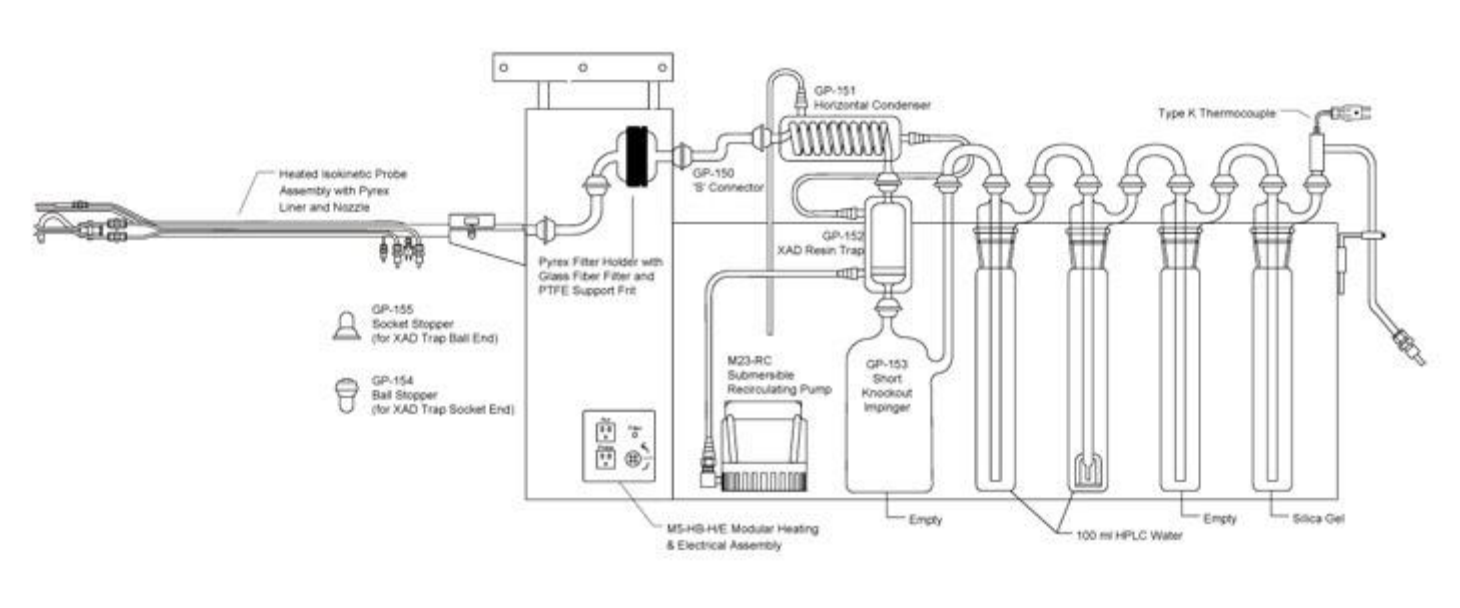
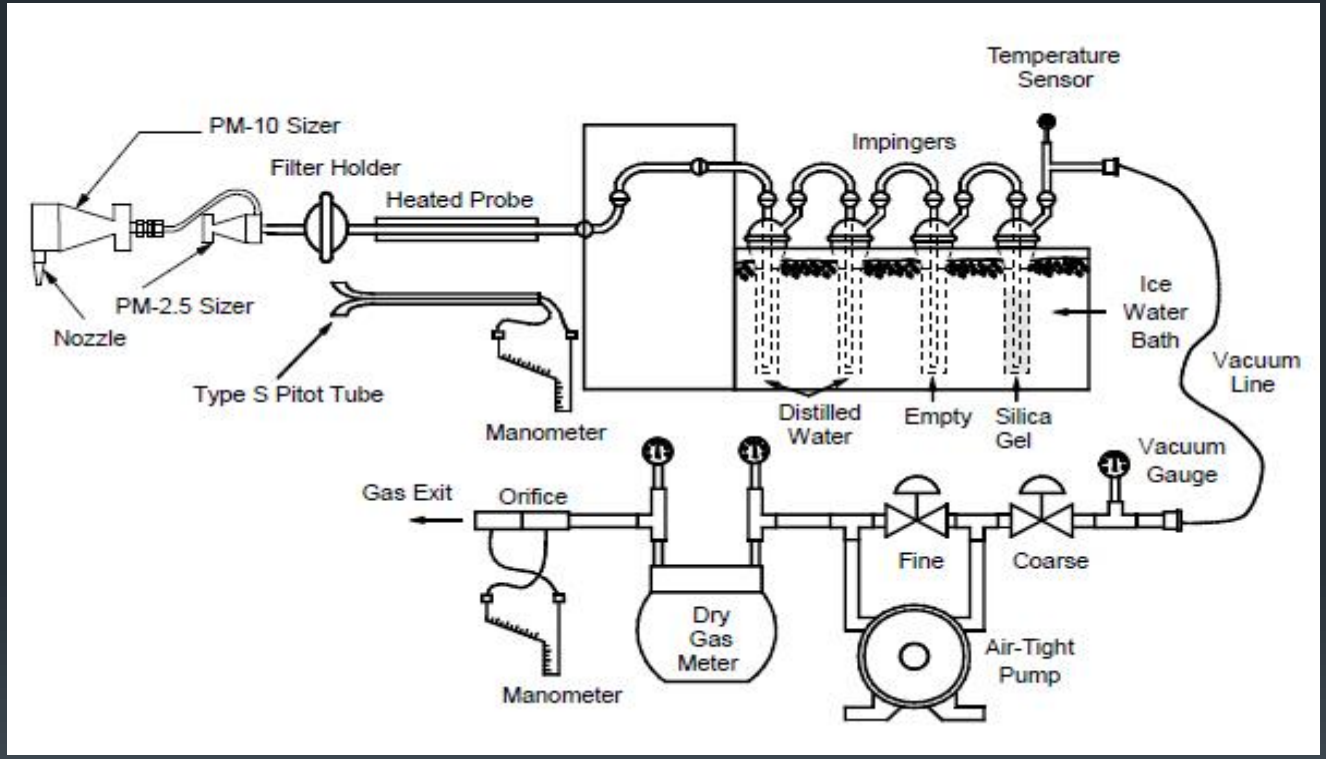
US EPA Reference Method 23



Captures Dioxins and Furans

US EPA Reference Method 201a



Captures PM_{10} and $PM_{2.5}$

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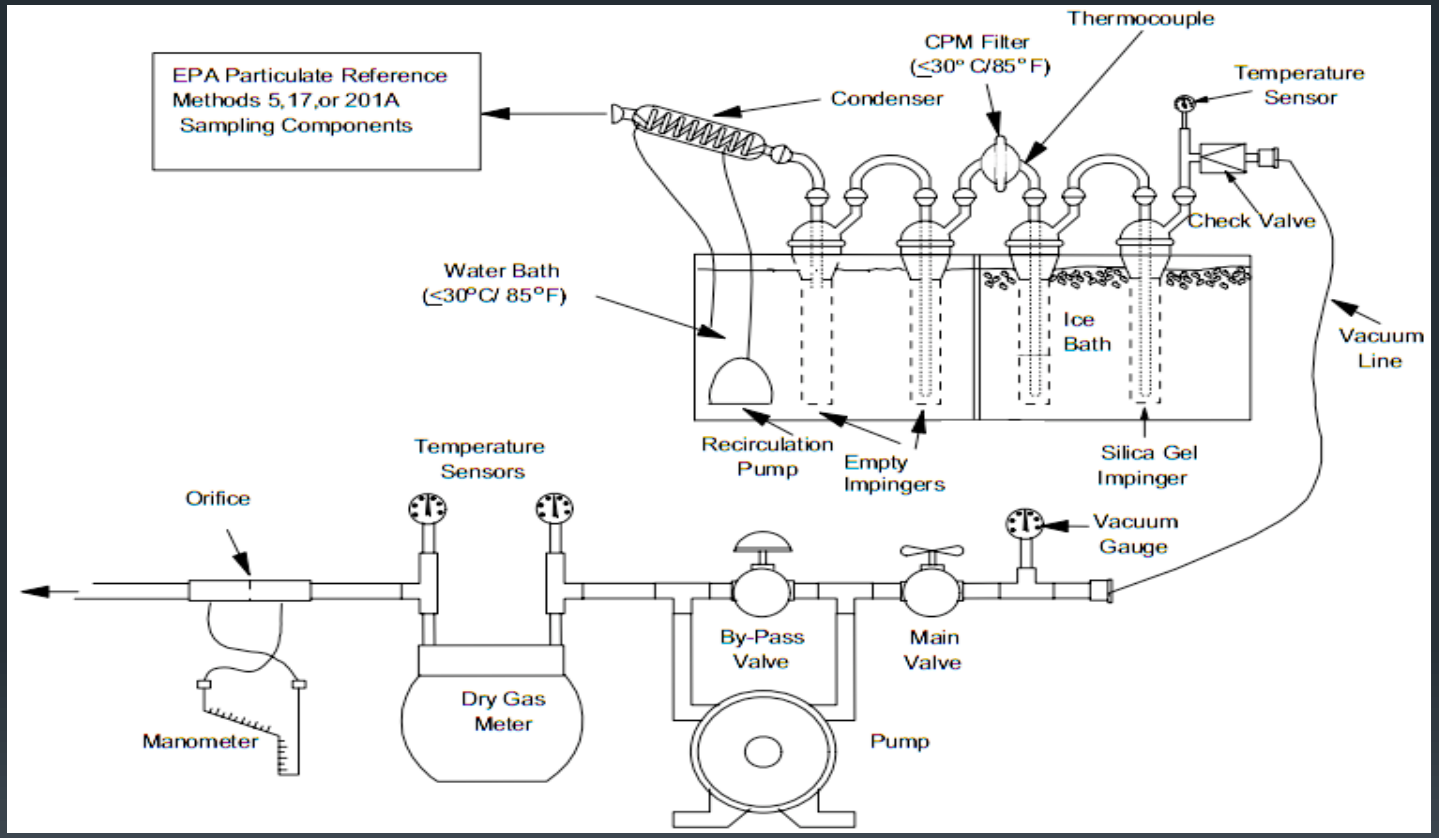
US EPA Reference Method 202



Captures condensable PM (replaces back half of method 5)

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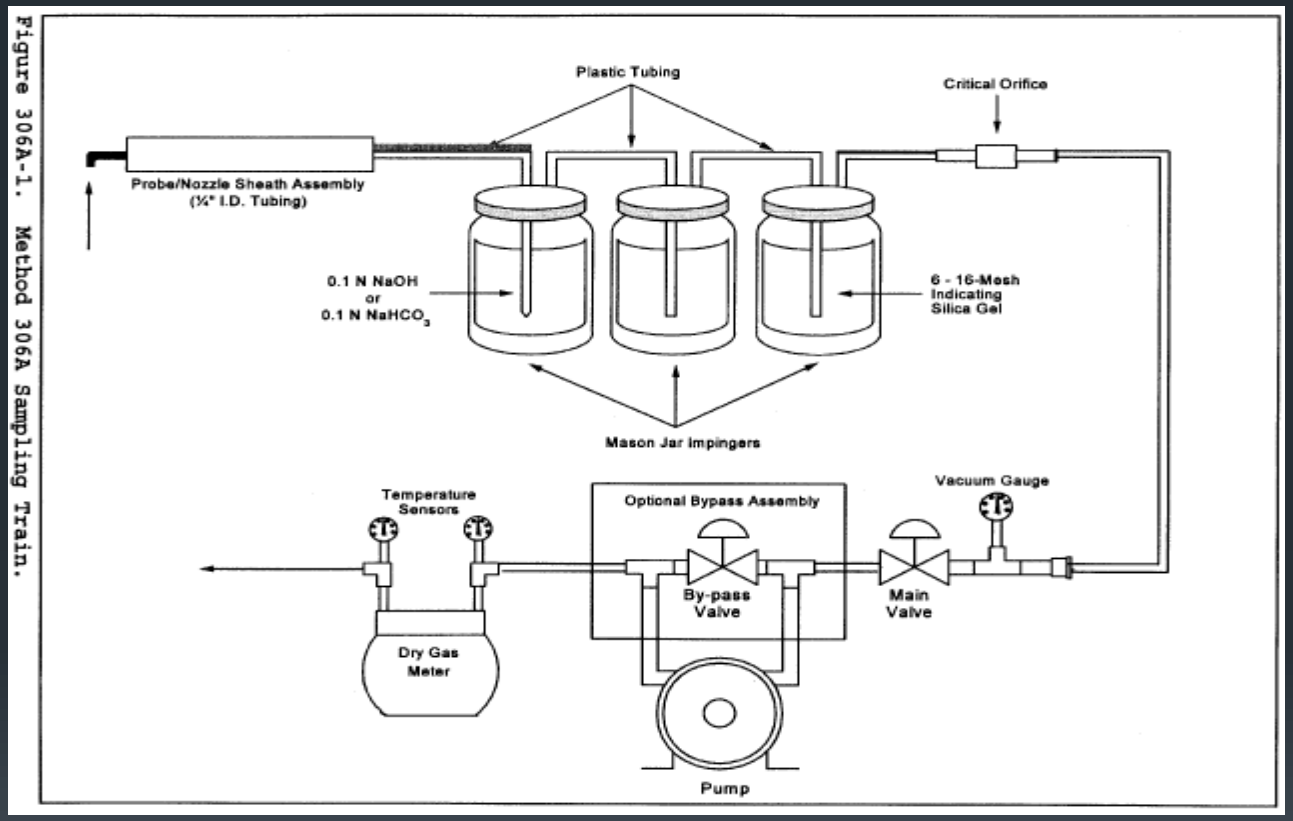
US EPA Reference Method 306a



Captures chromium emissions

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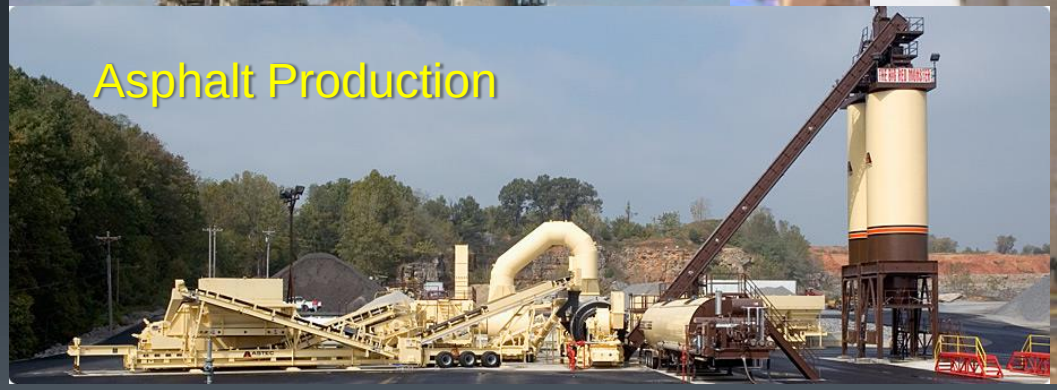
Sources of Particulate Matter



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Common PM Controls

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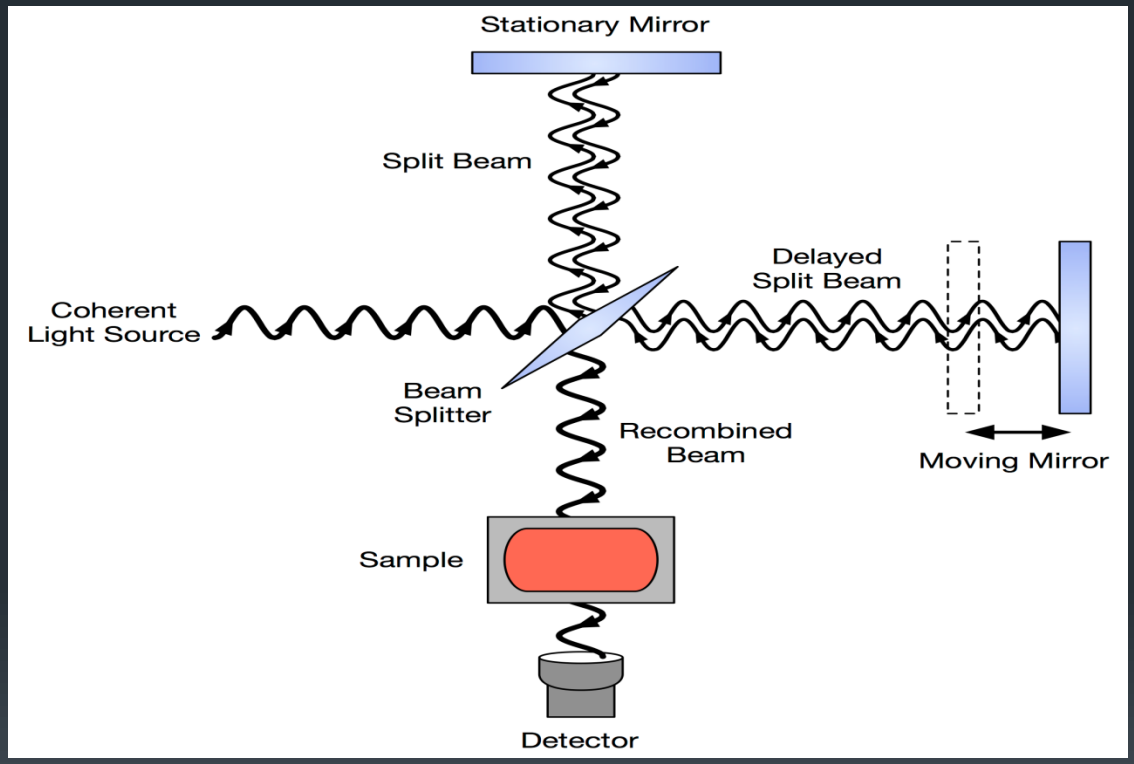
Types of Performance Testing

- Most common types of testing are:
  - Instrumental Sampling
    - CLD (Chemiluminescence Detector)
      - » NOx – RM7E
    - FID (Flame Ionization Detector)
      - » VOC - RM25A
    - NDIR (Non-dispersive Infrared)
      - » CO – RM10
      - » O_2/ CO_2 – RM3A
    - Pulsed Fluorescence
      - » SO_2 – RM6C
    - FTIR (Fourier transform infrared spectroscopy)
      - » Non-diatomic molecules (mainly used for HAPs) – RM320

FTIR

- Can test for most gases
- Cannot read diatomic molecules (ex. Oxygen (O_2), Nitrogen (N_2), etc.)

FTIR



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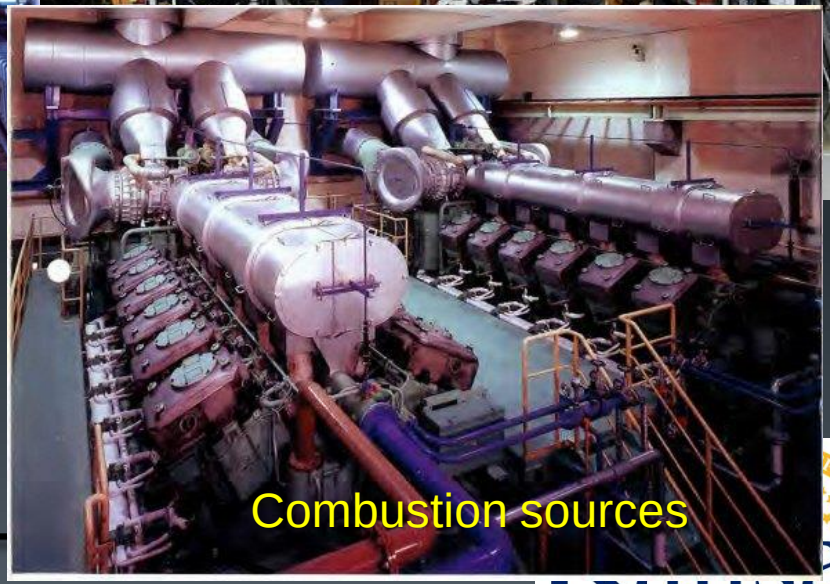
Sources of NOx, CO, SO_2, VOC, HAPs



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Common Gaseous Controls

Continuous Emissions Monitoring System (CEMS)

- Similar to analyzers used for instrumental sampling
- CEMS also available for measuring PM, mercury (Hg), flow rates, moisture, opacity

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RATAs

- Relative Accuracy Test Audits
  - Quality assurance test for CEMS
  - Tested by comparing the Relative Accuracy (RA) between a tester's analyzers reference method (RM) against the CEMS
  - RATA consists of nine to twelve 21-minute runs
  - RA = (|avg diff| + |cc| / |avg RM|) * 100

Performance Tests/RATAs

- Example of large tests performed in 2014 -2016
  - Monarch Cement (D/Fs, HCl, PM, etc.)
  - Case New Holland (D/Fs, HCl, PM, etc.)
  - Exide (Pb testing)
  - Sunflower – Rubart (PM, NOx, CO, VOCs)
  - Precision Industries (Hex Chrome)
  - La Cygne (Mercury)

Performance Tests/RATAs

Total number of Performance tests for the 2015-16 fiscal year:

107 tests* were conducted.

47 were observed by KDHE (44%).

*An entire facility tested in the same period is counted as 1 test, so there may actually be dozens of units tested in “1” test.

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Performance Tests/RATAs

Total number of RATAs from 2015-16 Fiscal year:
51, of which 28 were observed by KDHE (55%)

Required to observe at least 25% of all RATAs

Questions?

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References: www.omicsonline.org, www.aparatura.ro, en.wikipedia.org, https://www3.epa.gov/ttn/emc/promgate.html